

NON-PUBLIC?: N
ACCESSION #: 9010190205
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Zion Unit 2 PAGE: 1 OF 3

DOCKET NUMBER: 05000304

TITLE: Unit 2 Trip Due to Condenser Boot Failure
EVENT DATE: 09/07/90 LER #: 90-010 REPORT DATE: 10/09/90

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 98

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR
SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: John Clevenger, Engineer TELEPHONE: (708) 746-2084

COMPONENT FAILURE DESCRIPTION:
CAUSE: X SYSTEM: SG COMPONENT: EXJ MANUFACTURER: D067
REPORTABLE NPRDS: Y

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On 9/7/90 Zion Unit 2 tripped on a sudden loss of condenser vacuum. Inspections found a failed condenser expansion boot in the A-bay of the condenser, a failed low pressure turbine rupture disc, and that both of the feed water pumps' rupture discs had been deformed. Internal inspection of the condenser determined that the initiating event had been a failure of the boot. The root cause analysis determined that the condenser expansion boot had a life expectancy of 5 to 7 years but had been in service for 9 years. Aggravating the aged condition was improper torquing and exposure to excessive temperature. All safety systems responded as designed. Corrective action included replacement of the damaged components, adding the boots to the Preventive Maintenance program to ensure that they are replaced at 5 year intervals, and to follow vendor installation recommendations.

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END OF ABSTRACT

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A. CONDITION PRIOR TO EVENT

MODE 1 Power RX Power 98 - RCS AB! Temperature/ Pressure 559 degrees / 2235 Psig

B. DESCRIPTION OF EVENT

On 9/7/90 at 1947 hours Unit 2 tripped on loss of condenser vacuum SG!. Inspection of the condenser found a failed condenser expansion boot in A-bay, one failed low pressure turbine rupture disc on the "A" low pressure turbine, and 2 deformed feed water pump rupture discs which also exhaust into the A-bay of the condenser. Inspection of the condenser internals found no damage except that the expansion boot cover plate was bent inward at approximately 45 degrees at the point of the boot failure, indicating a large in-rush of air into the condenser. The normal steam flow into the condenser failed to condense in the presence of this large amount of non-condensable gas, and pressurized the condenser. The over-pressurization caused the failure of the low pressure turbine rupture disc and the deformation of the feed water pumps' rupture discs. The loss of vacuum and subsequent over-pressurization was too rapid to permit operator action to prevent the Unit trip.

C. APPARENT CAUSE OF EVENT

The reactor trip on 9/7/90 was the result of the failure of A-bay condenser expansion boot. Review of various plant data on extraction steam pressures and temperatures, off-gas flows, condenser vacuum, and other systems supports failure of the expansion boot as the cause of this reactor trip. The expansion boot was in service for 9 years which is in excess of the 5 to 7 year life expectancy recommended by the manufacturer. Aggravating the old age of the boot were mechanical and thermal stresses. During the boot replacement, the vendor supplied guidance on temperature ranges and torque values to prevent premature deterioration of the boot. The torque values on the clamps that hold the boot in place were found to be in excess of this recommendation and the temperatures that the boot was exposed to in service may have exceeded that which the boot material could withstand.

D. SAFETY ANALYSIS OF EVENT

The reactor trip followed the turbine trip on low condenser vacuum. The Reactor Protection System actuated normally. All safety systems responded as designed.

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E. CORRECTIVE ACTIONS

Researching the history of the boots showed that the boot in C-bay was the same age, 9 years, as the boot in A-bay. The boot in B-bay was 2 years old. The B-bay boot was inspected and some deterioration, possibly due to over-torquing, was found. The condenser expansion boots in all three condenser bays were replaced.

To prevent condenser expansion boots from being left in service past their service life, they have been added to the Preventive Maintenance program to be changed out every three outages (approximately every 5 years). The comment section of the Mechanical Maintenance shop job sheet for the main condenser has been updated to include instructions to follow the vendor recommendations for torque values. The job sheet is referenced by the Work Analyst prior to analyzing any work request on the Main Condenser.

Researching the history of the condenser expansion boots on Unit 1, it was determined that the boots in A-bay and C-bay were replaced in 1988. There is no history of when the boot in B-bay was last changed out. The boots in the Unit 1 condenser have also been added to the Preventive Maintenance program. The boot in B-bay will be changed out during the next refueling outage.

Additionally, appropriate procedure changes will be made to prevent introducing steam to the condenser when no vacuum is present. The annunciator response manual (ARM) will be changed to include notifying Tech Staff when the Exhaust Hood Temperature High-High annunciator alarms. The ARM will also be changed to include introducing steam to the condenser with no vacuum present as a probable cause for this alarm.

These open items will be tracked by commitment #304-180-90-10601 (series).

F. PREVIOUS EVENTS

Several condenser boot events at other plants were reviewed for similar plant conditions. No cases were found where the condenser vacuum failed so quickly that the operators had no warning and no time to react.

G. COMPONENT FAILURE DATA

Dearborn Rubber Co.
406 E. Plaza Drive
Westmont, IL. 60559

Condenser Expansion Boot
dogbone shape
10" wide X 5/8" thick X 122' long
Neoprene cover with polyester web

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Form "15-52-2.3" omitted.

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Commonwealth Edison
Zion Generating Station
Shiloh Blvd. & Lake Michigan
Zion, Illinois 60099
Telephone 708 / 746-2084 October 9, 1990

U.S. Nuclear Regulatory Commission
Document Control Clerk
Washington, D.C. 20555

Dear Sir:

The enclosed Licensee Event Report number 90-010-00, Docket No. 50-304/DPR-48 from Zion Generating Station is being transmitted to you in accordance with the requirements of 10CFR50.73(a)(2)(iv), which requires a 30 day written report when any event or condition occurs that results in manual or automatic actuation of any Engineered Safety Feature.

Very truly yours,

T. P. Joyce
Station Manager
Zion Generating Station

TPJ/blg

Enclosure: Licensee Event Report

cc: NRC Region III Administrator
NRC Resident Inspector
INPO Record Center
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